



THE CITY OF SPRINGFIELD MISSOURI

NPDES Storm Water Permit Annual Report



National Pollutant Discharge Elimination System
Municipal Separate Storm Sewer System
Permit MO-0126322

Prepared by:
Storm Water Services Division
Department of Public Works
December 2003

Signatory Requirements

As required in Part VI.H of NPDES Permit MO-0126322, all reports for the Permit shall be signed by:

- Either a principal executive officer or ranking elected official

Any person signing documents under this section shall make the following certification:

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.”

Tom Finnie
City Manager

Date

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1.0 Introduction

This report documents the first year activities related to the City of Springfield's (City) National Pollutant Discharge Elimination System (NPDES) Permit MO-0126322 issued by the Missouri Department of Natural Resources for the City's Municipal Separate Storm Sewer System (MS4). This Permit covers a period of five years from July 26, 2002 through July 25, 2007. This annual report covers the first permit year from July 26, 2002 through June 30, 2003 and provides the necessary documentation to fulfill the reporting requirements specified in Part V.D of the Permit. This report also serves as an overview of the significant activities implemented by the City to enhance water quality from the MS4. The City's Storm Water Services Division of Public Works compiled this report with assistance and input from Public Works Engineering, Operations, Sanitary Services, Solid Waste Management, and Street Maintenance divisions, along with the Springfield Fire Department, the Springfield-Greene County Parks Department, and the Missouri Department of Transportation.

2.0 Contacts List

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3.0 Storm Water Management Program Evaluation

Department of Public Works
Storm Water Services Division

Mission

The Storm Water Services Division is committed to the advancement and continuous improvement of the quality of life for the citizens of Springfield by being a leader in the development of storm water solutions to meet the needs of the community and by placing the welfare and safety of the public above all other considerations.

This will be achieved through:

Quality Customer Service

By being prompt and courteous in responding to all service requests with a professional approach and a meaningful and helpful resolution.

Effective Communication

By taking the initiative to communicate openly with the public and to effectively communicate with neighborhoods on important local issues.

Cooperation with Partners

By developing partnerships with other organizations, groups and individuals with similar objectives and cooperating with those partners to increase the program effectiveness.

Education and Advancement

By being a recognized leader in public education by increasing community understanding of storm water priorities and goals.

Leadership and Excellence

By taking a leadership role in developing a model program through the utilization of advanced innovations and a commitment to excellence.

A primary objective of Springfield's Storm Water Management Program (SWMP) is the implementation of **Best Management Practices** (BMPs) to protect and enhance the water quality of the MS4. The SWMP elements required in the first year of the Permit have been implemented and are discussed in the Narrative Section of this report. The SWMP includes additional elements, which are highlighted below. These accomplishments have made a significant contribution towards enhancing the water quality of the region through sound storm water management principles.

◆ Following the 1993 floods, a Citizens Storm Water Committee was appointed by City Council to review Springfield's Storm Water Management Program. A primary recommendation of the Committee was a Floodplain Acquisition Program to acquire flood-prone properties and undeveloped acreage within sinkhole boundaries and along riparian corridors. In 1994, the City began its Floodplain Acquisition Program. This proactive program has allowed the City to secure floodplains for greenspace uses especially along key riparian corridors. The public has benefited in terms of flood control, wildlife habitat, recreational uses, and enhanced water quality as a result of this program. The preservation and restoration of natural vegetation within the floodplains reduces erosion and serves as a filter to remove sediment, nutrients, and other pollutants from storm water. In addition, the preservation and expansion of buffer areas adjacent to sinkholes has enhanced the quality of our groundwater. The City's sinkhole protection ordinance (City Code Sec. 96-6) restricts development in sinkholes, preventing the creation of new flooding problems while providing downstream water quality benefits. An important tool for implementing BMPs near sinkholes is the *Springfield Area Watersheds and Sinkholes* map. This map, included in Appendix A, shows the boundaries and watersheds of approximately 250 sinkholes that cover an area of over 600 acres. The City has expended approximately \$8.8 million in Floodplain Acquisition Program funds to acquire:



Figure 1 - Ozark Greenways trail along the riparian corridor of South Creek

- ▶ 167 acres of riparian corridors and adjacent floodplains along Galloway Creek, Wilsons Creek, and South Creek for permanent greenspace and other water quality benefits
- ▶ 84 sinkhole properties for permanent greenspace and other water quality benefits
- ▶ 30 properties in flood-prone areas for permanent greenspace and other water quality benefits

During the first permit year the City acquired 7 sinkhole properties, 3 properties in flood-prone areas for storm water improvement projects, and 1 floodplain property for permanent greenspace and other water quality benefits.

Springfieldians have placed a high priority on improving quality of life through flood control and water quality enhancements. Voters approved storm water bond issues, funded through a Level Property Tax, in 1995, 1999, and 2001, which have provided \$43 million for floodplain acquisitions and improvement projects. Storm water improvements funded through bond issues and other sources have evolved from a single-purpose flood control objective to multi-purpose facilities that provide water quality enhancement, wildlife habitat, and recreational benefits in addition to flood control. Public-private and public-public partnerships have also been instrumental in the advancement of multi-purpose facilities as summarized in the following partnership projects:

- ◆ The City has implemented stream channel stabilization, algae management measures and other BMPs as recommended in the *Southern Hills Lakes Preliminary Evaluation and Management Plan: Summary Report* prepared by Wright Water Engineers, Inc. This study is available on the Storm Water Services Division web page at www.springfieldmo.gov/stormwater/stormwater_docs.html.

- ▶ The South Edgewater Drainage Improvement Project addressed a long-standing channel flooding and sediment/erosion problem between the north and middle lakes in Southern Hills. The project, which received neighborhood-funding support, provided needed capacity enhancements and erosion control for approximately 1400 lineal feet of channel.



Figure 2 – South Edgewater Drainage Project – Before



Figure 3 – South Edgewater Drainage Project - After

- ▶ A stream bank stability channel was installed and a catch basin was constructed above the north lake to provide for the removal of sediment and debris prior to it entering the lake.
- ▶ In the first permit year, construction began on a cooperative project between the City and the private developer to retrofit two existing detention basins in the 1800 block of Ingram Mill Road. The voluntary acquisition of flood-prone properties allowed the existing basins to be upgraded, which significantly increased storage volumes. Flood control improvements and water quality benefits were also achieved through the construction of new control structures. A landscaping plan is being implemented to enhance aesthetics and provide a more park-like setting for the neighborhood.
- ▶ As part of the US Highway 65 interchange project, the Missouri Department of Transportation constructed detention basins to reduce downstream erosion and sedimentation in the Southern Hills lakes.
- ▶ In a cooperative project between the City and the Southern Hills Neighborhood Association, lake management options and recommendations for managing algae growth in the Southern Hills Lakes were implemented using nationally recognized BMPs.



Figure 4 – Stream bank stability channel and catch basin installed above the north lake in Southern Hills



Figure 5 – Upper detention basin in the 1800 block of Ingram Mill Road

- ◆ The regional detention basin located at the Jones Family YMCA on Republic Road is an outstanding example of a multi-purpose storm water facility. The basin serves as a flood control facility for downstream properties while providing recreational opportunities (youth soccer fields & walking/jogging track) for the community. The basin, which was a public-private partnership project, is the City's largest regional detention facility, providing in excess of 2.5 million cubic feet of detention storage.



Figure 6 – The detention basin at the Jones Family YMCA serves as a soccer field and track during dry weather.



Figure 7 – The detention basin at the Jones Family YMCA serves as a flood control facility during wet weather.

- ◆ The City, in partnership with Southwest Missouri State University (SMSU), constructed a regional storm water detention basin at National & Grand, which provided needed storage for downstream properties. SMSU and the City advanced a design that converted existing impervious areas into environmentally beneficial greenspace. The landscaping plan focused on preserving as many mature trees as possible, which enhance the greenspace visually and provide water quality benefits.



Figure 8 – Regional detention basin at Southwest Missouri State University

The groundwork for comprehensive Watershed Master Plans is being laid through development of enhanced flood hazard maps and various technical studies.

- ◆ The City remapped the following FEMA floodplain areas using more accurate input data and improved modeling/mapping methods:

- ▶ South Creek – 7.1 miles
- ▶ Jordan Creek – 8.7 miles
- ▶ Galloway Creek – 5.2 miles

These areas were remapped as part of a Cooperative Technical Partner agreement with FEMA in which floodplain remapping will be a cooperative effort that utilizes local experience and knowledge. The City is developing City Flood Hazard Maps for flood-prone areas that are beyond the designated FEMA flood boundaries. As part of this effort, approximately 4.9 miles of the Inman Creek watershed was mapped in the first permit year.

- ◆ The City retained Wright Water Engineers, Inc. to study the feasibility of developing constructed wetlands in the Wilsons Creek watershed to reduce nutrient loads in ambient and storm flow conditions. This study was initiated to investigate the cost/benefits of using regional wetlands to reduce nutrient loads in Jordan Creek. The study report establishes the level of feasibility and nutrient removal at five potential sites. This report will prove to be valuable in the event that additional studies are conducted to develop regional wetlands along Wilsons Creek. This report is available on the Storm Water Services website at www.springfieldmogov.org/stormwater/stormwater_docs.html.

Major Findings

- ◆ Structural Best Management Practices (BMPs) can be an effective means of reducing the sediment and pollutant load in storm water runoff. Since the adoption by City Council in April 1999 of the Water Quality Protection Policy requiring the construction of extended detention basins and other BMPs in sensitive watersheds, the following observations have been made:

- ▶ BMPs require more careful design and construction to avoid problems of excessive maintenance needs, objectionable aesthetics, and an association by the public with health risks such as West Nile Virus.
- ▶ Due to the problems listed above, the use and design of BMPs should be considered carefully prior to mandating their application to all developments.
- ◆ Mapping of the MS4 has proven to be a valuable tool for illicit discharge investigation, development of the Field Screening Program, watershed planning, and other storm water management activities. Mapping of the entire MS4, which is estimated to involve approximately 42,000 features, will take several years with current resources.
- ◆ Public Works has developed and implemented deicing practices for the City's streets that are both effective for traffic safety and sensitive to potential pollutant runoff. These practices are discussed in Section 5.3 of this report.
- ◆ Public Works and the Parks Department have implemented BMPs for usage of pesticides, herbicides, and fertilizers (PHFs) to ensure proper environmental controls. These BMPs are discussed in Section 5.5 of this report.
- ◆ Field screening of twenty-five points in the Galloway Watershed found no discharges at these points. The Field Screening Program is further discussed in Section 5.6 of this report.
- ◆ The results from the first year of representative monitoring, which requires ambient and wet weather sampling at six in-stream locations, exhibit some preliminary trends. The results are shown in Table 5 and discussed in Section 6.3.3 of this report.

Program Strengths

- ◆ Since 1993, Springfieldians have continued to demonstrate increased public support for implementation of sound storm water management practices. Voters passed initiatives for storm water funding in 1995, 1999, and 2001. Water quality has become an increasing priority among citizens and civic leaders, as shown in the five-year update of the Vision 20/20 Comprehensive Plan. The Vision 20/20 Water Quality Planning Group is providing goals and objectives for storm water management in the future.
- ◆ Since 1994, the City has expended approximately \$8.8 million in Floodplain Acquisition Program funds to acquire flood-prone properties and undeveloped acreage within sinkhole boundaries and along riparian corridors. The preservation of riparian corridors and the adjacent floodplains is basic to meeting our community's water quality, flood control, wildlife habitat, greenspace, and recreational needs and expectations.
- ◆ Since 1995, the City has committed over \$14 million to a comprehensive Infiltration and Inflow (I/I) Program. The I/I Program reduces the incidence of sanitary sewer overflows into the storm water system through a proactive Sewer System Evaluation Survey. The Sewer System Evaluation Survey was completed system-wide in June 2003. Since 1996, approximately 41,000 lineal feet of sanitary sewer lines and over 10,000 manholes have been rehabilitated. Wet-weather sanitary sewer overflows have significantly decreased in both frequency and duration. Ten percent of sanitary sewer revenues are earmarked to finance ongoing I/I efforts.
- ◆ The City's education program covers a wide-range of storm water quality topics including proper use and disposal of household chemicals through the City's Household Chemical Collection Center, and environmentally responsible yard care practices advocated by the Show-Me Yards & Neighborhoods Program. An outstanding network of individuals, agencies, and organizations, which include the Watershed

Committee of the Ozarks and the James River Basin Partnership, provide educational and public involvement opportunities on water quality issues on an annual basis.

- ◆ Public Works has developed and implemented a comprehensive street cleaning program and a thorough system of routes for debris removal from the storm water system. In the first permit year, the City's street sweepers collected 1380 tons of trash and debris. The system of routes for debris removal from the storm water system includes:
 - ▶ 1 bridge route with 10 priority locations
 - ▶ 1 sinkhole route with 12 priority locations
 - ▶ 2 waterway routes, north and south, with 85 priority locations
 - ▶ 12 grate routes with over 1700 priority locations

Program Weaknesses

- ◆ In May 2003, Jonathan Jones of Wright Water Engineers, Inc. in Denver, Colorado, provided City Council with an evaluation of Springfield's Storm Water Management Program from a national perspective. While the evaluation ranked the program favorably, it targeted areas for improvement to strengthen the program in the future. In addition to successfully administering and complying with the requirements of the Permit, Mr. Jones' recommendations included:
 - ▶ Increase permanent funding for system maintenance, staffing, administration and operations.
 - ▶ Initiate high-priority watershed planning.
 - ▶ Develop a comprehensive drainage criteria manual.
 - ▶ Obtain authority to require grading plan in development submittal process.
 - ▶ Implement Pierson Creek, South Dry Sac and sinkhole water quality requirements citywide.
 - ▶ Enact ordinances regarding adoption of drainage criteria manual and master plan, and provide City authority to require grading permit.
 - ▶ Increase public education and involvement, in general.

Other program enhancements that should be considered included:

- ▶ Continue to improve water quality, especially in the James River Basin.
- ▶ Continue to prepare detailed flood hazard maps.
- ▶ Evaluate and, following a screening process, propose a permanent funding source for the storm water program, potentially in combination with Greene County. This would likely be a storm water utility.
- ▶ Implement pilot projects regarding new storm water and stream channel management practices, such as "low-impact development" and "bioengineering" for stream channel stability.
- ▶ Continue acquisition of flood-prone structures and preservation of riparian corridors.
- ▶ Encourage multi-purpose facilities that are valuable community assets, like the YMCA detention basin, including partnerships to create such facilities.
- ▶ Adopt a more proactive approach to erosion control at construction sites, emphasizing education.

Future Direction of the SWMP

- ◆ The following activities are scheduled for implementation in the second permit year, as indicated in Part III.A of the Permit:
 - ▶ Continue to assess the impacts on the water quality of receiving waters from flood management projects.

- ▶ Continue to study municipal waste management facilities that are not permitted by a separate permit and determine if additional BMPs are needed to control pollutants to the MS4 and, if so, develop a schedule for implementation.
- ▶ Develop standard procedures for investigation of reports of illicit discharges and for enforcement to prevent such discharges.
- ▶ Develop and implement a program that informs the public on how to report spills, illegal dumping, illicit connections and water quality problems.
- ▶ Develop a program to identify industries that discharge to the MS4.
- ▶ Develop a program of periodic biological assessments of at least two urban streams. The assessments will begin in year three.

◆ The following activities implemented in the first permit year will undergo further development in the second year:

- ▶ The activity for periodic inspections of storm water quality control structures required in Part II.A.1.b of the Permit will include an inventory of storm water quality control structures and the development of inspection schedules, procedures, and documentation.
- ▶ The maintenance program for collection and removal of floatables required in Part II.A.1.c and the activity for routine cleaning of inlets and catch basins required in Part II.A.3.d of the Permit will be enhanced with new database system upgrades. This new database system will strengthen the City's reporting capabilities, allowing for the reporting of data that is currently unavailable from the existing database system for inclusion in this annual report.

◆ Additional activities are planned for the second permit year that are not required by the Permit. These activities are contingent upon available resources.

- ▶ It is anticipated that a network of rain gauges will be set up to supplement precipitation data from the National Weather Service station at the Springfield-Branson Regional Airport. The additional data sets will enhance the accuracy of estimates for the wet-weather sampling discharge volume and for the total annual volume of urban runoff discharges.
- ▶ The possibility of utilizing an automated sampler to obtain storm water quality data will be investigated.
- ▶ As recommended in the goals identified under Program Weaknesses, the City's storm water drainage criteria manual will be revised with a focus on water quality. The revision process is being implemented on a schedule in conjunction with the presentation of recommendations from the Vision 20/20 Water Quality Planning Group.
- ▶ Preparation will continue on a city flood hazard atlas to identify flood-prone areas for the Floodplain Acquisition Program.
- ▶ The Vision 20/20 Water Quality Planning Group will evaluate sources of long-term funding for storm water management.
- ▶ The City will seek funding sources for bioengineered stream bank stabilization projects.

4.0 SWMP Summary Table

Table 1 has been prepared according to the format outlined in Part V.D.2.c. of the Permit. The Summary Table documents program activities that are quantifiable. Some activities could not be quantified and therefore do not appear in the Summary Table but are discussed in the Narrative Section of the report.

Table 1 - Storm Water Management Program Summary Table

Program Element	Task	Required Schedule	Schedule Adhered?	Number of Activities Accomplished	Available Documentation & Comments
Structural Controls	MS4 Inventory	N/A	N/A	5,447 structures or 12.88% of system mapped	See Appendix B and Section 5.1, Activity 1.a
	Inspections of MS4 quality control structures	Periodic	Yes	90 waterway and detention basin properties mowed every 4-6 weeks from April through October	See Section 5.1, Activity 1.b
	Debris removal (waterway, bridge, sinkhole and grate routes)	Existing program schedule	Yes	To be quantified in 2 nd annual report	Data availability pending database system upgrade, See Section 5.1, Activity 1.c
Roadways	Street Cleaning	Existing program schedule	Yes	1,383.15 tons of debris collected	See Section 5.3, Activity 3.b
	Clean inlets and catch basins	Existing program schedule	Yes	To be quantified in 2 nd annual report	Data availability pending database system upgrade; See Section 5.3, Activity 3.d
	Dry-weather field screening	50 points/year	Partial	25*	Field Data Sheets; *See Section 5.6, Activity 7.b
Illicit Discharges & Improper Disposal	Wet-weather field screening	25 points/year	No	0*	*See Section 5.6, Activity 7.b
	Spill response	As needed	Yes	11	See Section 5.6, Activity 7.d
	Public education on proper use and disposal of oil and toxic materials	N/A	N/A	99,078 lbs. collected at HCCC	See Section 5.6, Activity 7.f
	Reduce sanitary sewer overflows to the maximum extent practicable	Existing program schedule	Yes	# of sub-basins: Dye water test = 1 TV inspection = 48 SSES = 48	Quarterly reports sent to MDNR; See Section 5.6, Activity 7.g
	Ambient sampling	6 sites 3 times per year	Yes	5 sites 3 times & 1 site 2 times*	See Section 6.3, Table 5. *Pea Ridge Creek sampling site dry on 11/12/02 sampling event
Representative Monitoring	Wet-weather sampling	6 sites once per year	Yes	1 sampling event at 6 sites	See Section 6.3, Table 5

5.0 Narrative Report

The purpose of this section of the report is to discuss those SWMP elements required for development under Parts II and III of the Permit. The activities for each element are identified with their corresponding number and letter listed in Part II.A of the Permit.

5.1 – Operation and Maintenance of Structural Controls

Activity: *1.a - Continue to update and maintain the inventory data for the MS4 within the City boundaries.*

The City currently has one full-time employee assigned to inventory and map the MS4. The inventory data includes six major components in two categories:

- ▶ Linear Features
 1. Pipe
 2. Box Culvert
 3. Channel
- ▶ Point Features
 4. Inlet
 5. Junction Box
 6. Detention Basin



Figure 9 - Digital mapping of the storm water system

These point and linear features are identified through the use of construction plans and aerial photography, as well as field verification and other documentation available. These features are digitized with the use of GIS software. Information about these structures is recorded in a corresponding database. This inventory data will assist the City in investigation of spills and illicit discharges in addition to being a useful tool for maintenance activities. Statistics on the inventory completed in the first permit year are included in Appendix B. Sinkholes within the City have also been mapped with the use of GIS software and represent a seventh feature type in the MS4. The *Springfield Watershed and Sinkhole Map* is included in Appendix A.

Activity: *1.b - Develop and implement a program for periodic inspections of the storm water quality control structures.*

The City is currently utilizing existing cleaning and mowing programs to inspect MS4 storm water quality control structures. As discussed in Activities *1.c* and *3.d*, Public Works personnel follow designated routes for debris removal from sinkholes, waterways, bridges, and storm grates. Maps showing these routes are included in Appendix A. The City currently mows and trims 90 waterway and detention basin areas. Continued mapping of the MS4 will facilitate further development of an inspections program. Increased funding will be necessary for staff to provide more comprehensive inspections and record keeping.

Activity: *1.c - Continue existing maintenance program by periodic collection and removal of floatables from the MS4 to the Maximum Extent Practicable (MEP).*

The Bridge & Waterways Section of Public Works routinely checks and removes debris from the storm water conveyance system after rain events. This scheduled maintenance activity consists of four route types:

- ▶ Bridge route with 10 priority locations
- ▶ Sinkhole route with 12 priority locations
- ▶ Waterway routes, north and south, with 85 priority locations
- ▶ 12 grate routes with over 1700 priority locations

Maps of these routes are included in Appendix A.

The two monitoring locations designated for the removal of floatable materials as required in Part V.B. of the Permit are reported in Section 6.4 of this report.

5.2 – Control of Discharge from Areas of New Development and Significant Redevelopment

Activity: *2.a - Consideration of incorporating Best Management Practices into land development and management activities of the entire area served by the City's MS4.*

In April 1999, City Council passed Resolution #8648 adopting a Water Quality Protection Policy for the Fulbright Spring, Pierson Creek, and sinkhole watersheds. The Policy, which was adopted in accordance with the short-term recommendations of the Water Resources Task Force and the 1995 Fulbright Spring Protection Study, recognizes the sensitivity of these watersheds. The Fulbright Spring and Pierson Creek watersheds are valuable sources for the community's drinking water supply. Due to the karst topography of the region, sinkholes are a direct connection to the shallow groundwater system that supports springs in the area. The requirements of the Policy apply to all new developments in these sensitive watersheds, which are shown on the *Springfield Area Watersheds and Sinkholes* map included in Appendix A. The Policy outlines requirements and design criteria for structural BMPs based on the following general design guidelines:

- ▶ Minimize runoff by reducing the amount of directly connected impervious area
- ▶ Maximize contact with grass and soil by directing runoff over vegetative filter strips and grass swales
- ▶ Maximize detention and settling time
- ▶ Design for small, frequent storms
- ▶ Utilize BMPs in series where possible
- ▶ Incorporate both flood control and storm water quality objectives in designs, where practical

Figures 10-12 show a privately-owned extended dry detention basin in the Fulbright Spring protection area that was constructed according to the Policy's design criteria.

Public input is being obtained through the City's Vision 20/20 Comprehensive Plan Water Quality Planning Group. The Group is considering alternatives to address the community's priority of protecting water quality including expanding the requirement for site BMPs to all watersheds within the City. Public Works is prepared to implement the community priorities set by the Group, which could be addressed in a revised storm water design criteria manual. Outstanding issues concerning the use and design of site BMPs include unwarranted maintenance costs, pollutant removal efficiencies, and public health concerns (i.e. West Nile Virus). A consultant is under contract to complete the City's storm water design criteria manual by Fall 2004.



Figure 10 – Storm water entering this extended dry detention basin discharges slowly through a gravel filter and perforated riser pipe. Slowing down the discharge rate allows sediment and pollutants to settle and helps prevent downstream erosion.



Figure 11 – Storm water entering the detention basin with a high sediment load



Figure 12 – Storm water discharging from the detention basin with a much lower sediment load

5.3 – Roadways

Activity: *3.a - Review current deicing practices, implementing changes where feasible to minimize the discharge of pollutants to the MS4.*

The City's current deicing practices emphasize providing safe driving conditions on municipal streets while also minimizing the potential for deicing materials to discharge into the MS4. The Street Maintenance Division uses rock salt, liquid salt brine and liquid calcium chloride for deicing the City's streets. The salt is stored in the City's salt dome building to prevent contact with storm water. During the winter months, a pad covered with a tarp is also used for storage of approximately 700 tons of salt. The runoff from this tarp drains to the sanitary sewer.

In 1997, the Street Maintenance Division began researching and experimenting with different distribution rates for rock salt used to melt snow and ice. Prior to this time, the Division was using a distribution rate of 500 pounds per lane mile. It was determined that an effective level of ice and snow removal for public safety could be provided using a reduced distribution rate of 200 pounds per lane mile. The following practices used by the Division help to provide an effective level of ice and snow removal while minimizing the discharge of salt and calcium chloride to the MS4.



Figure 13 – City salt dome

- ▶ Liquid calcium chloride and liquid salt brine are used to pre-wet the rock salt before it is sent to the spreader. Adding liquid calcium chloride or salt brine to rock salt helps shorten the reaction time of the rock salt and provides melting action at lower temperatures. Pre-wetting the rock salt also decreases the salt "bounce off" effect when the salt hits the road, thereby keeping more salt on the roadway and out of roadside ditches. Salt brine is used to pre-wet the rock salt until the temperature drops to 24°F, below which salt brine is not effective and calcium chloride is used.
- ▶ When the temperature is high enough that precipitation will start as rain before turning to snow, the Division waits until the snow occurs to apply rock salt to the roadway. If rock salt is applied before the rain turns to snow, the rock salt will get washed into the storm water system.

Activity: *3.b - Continue existing street sweeping program*

The Operations Division sweeps and cleans all curbed streets in the City. The curbed streets are divided into 47 routes that cover over 980 curb miles. This activity is accomplished with seven street sweepers that operate 40 hours a week during the day shift and two street sweepers that operate 40 hours a week during the night shift. During an average eight-hour shift, a sweeper can clean approximately 10 curb miles. Arterial roads are swept weekly. Collector roads and residential roads are swept six times per year. In addition, the Division routinely picks up debris such as tires, couches, appliances, and bags of trash that are left on the City's rights-of-way, as well as providing cleanup in response to spills/accidents and special events such as parades. The Missouri Department of Transportation (MoDot) sweeps and cleans state-maintained thoroughfares within the City Limits. During the first permit year, the City's street sweepers collected 1,380 tons of street sweepings.

Activity: *3.d - Continue routine cleaning of grated inlets, roadway storm water inlets, and catch basins.*

The Waterways and Bridges Section of Public Works administers an established program of cleaning the storm water conveyance system after rain events. This program includes 12 grate routes covering over 1700 storm grates. The grate route work orders include instructions to clean all pipes and inlets along the route. Maps showing the locations of these routes are included in Appendix A. The catch basin located above the north lake in the Southern Hills Neighborhood is cleaned on a quarterly basis. It was designed to reduce the amount of floatables and sediment entering the lake.

5.4 – Program to Monitor Pollutants in Runoff from Municipal Waste Management Facilities that are not Permitted by a Separate Permit

Activity: 5.b - Establish, as part of the field screening program, a monitoring and inspection program for municipal waste management facilities.

There are no active municipal waste management facilities within the City limits that are not permitted by a separate NPDES Permit. As reported in Part I of the application for this Permit, there are four closed landfills within the City limits as well as two fill areas that received demolition debris and possibly some municipal waste. These sites were in operation at various times from the 1920's through the mid 1960's. There are also three sites where the City's early wastewater treatment plants were located. These treatment plants have been closed and/or demolished. Two of the sites are at the same approximate location as two of the closed landfills. Field screening points will be established to monitor the drainage from these areas in forthcoming permit years. The locations are listed below and shown in Figure 14:

1. Talmage Street City Dump – NW corner of Talmage Street and Benton Avenue
2. Eastgate Landfill (privately owned) – NE corner of Catalpa Street and Eastgate Avenue
3. Loren Street City Dump (and Catalpa Street Treatment Plant) – North side of 2100 block of W. Catalpa Street
4. Bennett Street City Dump (and Wilsons Creek Treatment Plant) – SE corner of Bennett Street and Scenic Avenue
5. Walnut Street Landfill – NW corner of Walnut Street and Fort Avenue
6. National Avenue Landfill (clean fill only - construction materials and concrete) – NW corner of National Avenue and Trafficway
7. Pea Ridge Creek Treatment Plant – North of Doling Park

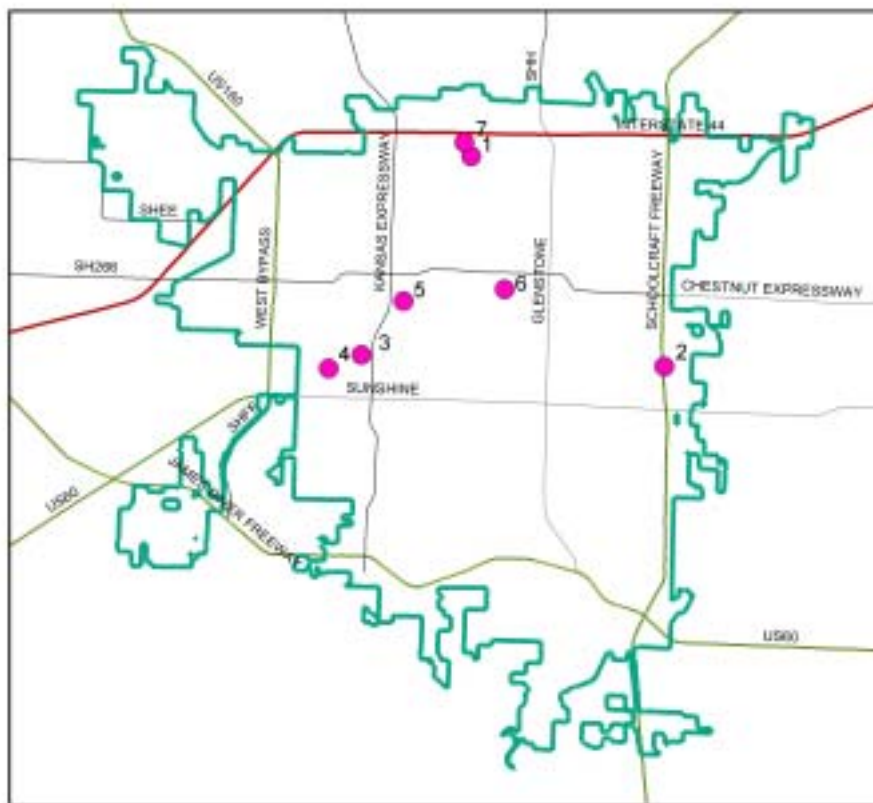


Figure 14 – Locations of non-permitted municipal waste management facility sites

5.5 – Use of Pesticides, Herbicides, and Fertilizers (PHFs)

Activity: *6.a - Continuation of public education program to promote the proper use, handling, storage, and disposal of PHFs through the Integrated Solid Waste Management System.*

The Solid Waste Management Division of Public Works provides the public with educational information on the proper use, handling, storage, and disposal of pesticides, herbicides, and fertilizers (PHFs). Information about the Show-Me Yards & Neighborhoods (SMY&N) Program and the Household Chemical Collection Center (HCCC) is featured at local community events, media opportunities and presentations summarized in Section 5.8 of this report. In addition, both the SMY&N and the HCCC were highlighted on the *Quality Ozark Streams* flyer included in City Utilities customer bills distributed to approximately 108,000 households in October 2002. This flyer is exhibited in Appendix D.

- ▶ SMY&N education and outreach activities are designed to raise awareness of the significant role lawns play in the total amounts of nutrients and pollutants in storm water runoff flowing to area waterways. SMY&N offers environmentally responsible lawn and landscaping tips, including proper use of PHFs. Individuals and professionals who put the SMY&N techniques into practice are recognized and commended – homeowners can earn an attractive yard sign and professionals can become certified. Professionals have been particularly responsive to the program. Following the Lawn Care Professionals Certification Workshop held on August 20, 2002, 65 professionals have now been certified. Homeowner seminars were held at the Home Show and the Lawn & Garden Show in January and February 2003. An annual Lawn Care Field Day is held every spring to showcase local homeowners' yards that have become certified as Show-Me Yards. SMY&N is funded through a 319 mini-grant from the Missouri Department of Natural Resources with additional funding from Public Works, the Watershed Committee of the Ozarks, and the James River Basin Partnership.



Figure 15 – SMY&N sign in a certified yard in Springfield

- ▶ The HCCC is available to Greene County residents for proper disposal of unneeded household chemicals, including PHFs. The Solid Waste Management Division has produced and distributed a brochure that provides information about visiting the HCCC and guidelines on proper storage and handling of household chemicals. This information is also available on the Division's web page at www.springfieldmogov.org/recycling/housechem.html. A summary of the amount of materials collected at the HCCC since it opened in 1994 is included in Appendix B. In the first permit year, 99,078 lbs. of materials were collected at the HCCC. Of this total, 79,948 lbs. were recycled and 19,130 lbs. were properly disposed of.

Activity: *6.b - Review municipal usage of PHFs on public properties and rights-of-ways to determine the effectiveness and feasibility of using alternatives to PHFs*

The Public Grounds Division of Public Works and the Springfield-Greene County Parks Department require that all pesticides, herbicides, and fertilizers (PHFs) be applied under the direct supervision of a Missouri licensed certified public operator as required by state law.

The Public Grounds Division uses herbicides to minimize species that require frequent mowing, particularly on street medians. Fertilizers are typically used only to promote reseeded areas and as part of the lawn care program designed for the Government Plaza. In these instances, a low-nitrogen, low-phosphorous product that focuses on promoting root growth is used. The Division's Grounds Maintenance Crew Leader has completed the Show-Me Yards & Neighborhoods Lawn Care Professionals Certification Program in commitment to environmentally sound lawn care practices, including minimum usage of PHFs.

The Springfield-Greene County Parks Department uses PHFs to maintain City parks according to the usage of the property. Sports fields and golf courses are fertilized to provide an optimal surface for sports activities and to compensate for the physical wear to the grass cover. A pre-emergent herbicide is used on these properties to minimize species that can require more frequent mowing. Pesticides are only used on city parks, golf courses, and sports fields if a persistent pest problem occurs. Usage is limited to the affected area only. The Parks Department does not use any pesticides that are registered with the Missouri Department of Agriculture as Restricted-Use Pesticides. Several Parks Department personnel have also completed the Show-Me Yards & Neighborhoods Lawn Care Professionals Certification Program.

Further study would be needed to determine the feasibility of using alternatives to PHFs to effectively serve the purposes of minimizing maintenance activities and providing optimal conditions for the community's sports activities.

5.6 – Illicit Discharges and Improper Disposal

Activity: *7.b - Development and implementation of a field screening program.*

The Field Screening Program at in-system locations and the Representative Monitoring Program at in-stream locations comprise a two-fold approach for monitoring the MS4. Table 2 illustrates the calendar schedule specified in the Permit for these two programs. The Representative Monitoring Program is discussed in Section 6.3 of this report. The Field Screening Program involves dry-weather and wet-weather screening.

- ▶ Dry-weather screening serves to identify illicit discharges to the MS4. If flows are present at screening locations during dry weather, field kits are used to test for chlorine, copper, phenol, and detergents. According to the testing results, further investigation is done to identify the source of the discharge. Screening is required at a minimum of 50 locations each permit year.
- ▶ Wet-weather screening serves to quantify the quality of industrial discharges to the MS4. Screening points that drain industrial areas are sampled following rain events that meet criteria specified in the Permit. The samples are sent to the City's Wastewater Laboratory for analysis. Sampling at 25 points each year is required.

Program Development

The method of establishing the required 250 field screening locations involves the utilization of MS4 inventory data along with sub-basin watershed configurations developed by the Storm Water Services Division. This is a practical and realistic methodology to approximate the density and distribution of screening locations that would be established using the grid cells methodology specified in Section II.A.7.b of the Permit. The sub-basin watersheds range in size from 0.01 square miles to 0.3 square miles, comparable to the specified size for grid cells. A GIS database has been created to contain the geographic and land use properties of each location and the results of screening.

Program Status

Forty screening locations have been established. Because the majority of the MS4 inventory data completed thus far has been in the Galloway watershed, the established screening locations are in this watershed. The remainder of

the 250 screening locations will be identified and submitted in accordance with program requirements. Dry-weather screening has been completed at 25 points. No flow was present at these points. A map of the 40 established screening locations, along with the screening status of each location, is included in Appendix A.

It should be noted that the first permit year had a shortened screening period. As shown in Table 2, the dry-weather screening is required to be conducted between June 1 and October 1 of each year. Since the Permit was issued on July 26, 2002, program development limited the available time for screening during this initial shortened period between July 26, 2002 and October 1, 2002. The period between June 1, 2003 and the end of the first permit year on June 30, 2003 remained for this activity, during which screening was done on the 25 points reported. Wet-weather screening, requiring sampling at 25 points each permit year, will be implemented in the second permit year. Additional dry-weather and wet-weather screening beyond the annual requirements will be conducted in the remaining permit years to achieve the program schedule over the life of the permit.

Table 2 – Calendar Schedule for Field Screening and Representative Monitoring Programs

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Wet weather sampling at 25 industrial discharge screening points		18 parameters – Anytime throughout the year Sampled no later than 48 hours after at least 0.2 inches and <3 inches during a 24-hour period preceded by at least 72 hours with no precipitation >0.1 inch																																																																																																																																																																																																																																																																																																																																																																																																																																																				

Activity: 7.d - Continue operation of the Emergency Spill Response Team.

The Fire Department's Emergency Spill Response Team responds to spills in accordance with the *Hazardous Materials & Chemical Emergency Response Plan* adopted by the City of Springfield in October of 1987. A copy of the plan is on file with the City Clerk.

In the first permit year, the Emergency Spill Response Team (ESRT) was dispatched to 2 spills to the storm water system, one in which the assistance of the ESRT was needed for spill containment and neutralization. Other spills and citizen reports of polluting activities occurred that did not require the assistance of the ESRT. In the first permit year, Storm Water Services personnel responded to a total of 5 spills, including those to which the ESRT was dispatched, and 6 citizen reports of polluting activities. These incidents are listed in Table 3. Storm Water Services has implemented the utilization of informational mailings in response to citizen reports of polluting activities. Depending on the nature of the report, these mailings are often sent to a broader group than the alleged responsible party. In the case of a report of a polluting activity at or near a residence, the mailing may be sent to the surrounding neighborhood if the source of the pollutant cannot be verified or if the polluting activity is suspected to be a common practice in the area. A mailing regarding a business activity that constitutes an illicit discharge to the MS4 may be sent out industry-wide in the case that the activity may be a common practice in the industry. In the first permit year, 2 informational mailings were sent out. These mailings are included in Appendix D. The development of standard procedures for investigation of illicit discharges and enforcement to prevent such discharges is required in the second permit year and will be reported in the second annual report.



Figure 16 - Emergency Spill Response Team assisting in spill containment and neutralization

Activity: 7.f - Continue program that informs the public on proper management and disposal of used oil and toxic materials.

The Solid Waste Management Division of Public Works provides public education on the proper management and disposal of used oil and toxic materials.

- ▶ The City's Household Chemical Collection Center is available to Greene County residents for proper disposal of unneeded household chemicals, including used oil and toxic materials. Information about the HCCC is featured in local community events, media opportunities and presentations summarized in Section 5.8 of this report. The HCCC was also highlighted on the *Quality Ozark Streams* flyer included in City Utilities customer bills distributed to approximately 108,000 households in October 2002. This flyer is exhibited in Appendix D. The Solid Waste Management Division has produced and distributed a brochure that provides information about visiting the HCCC and guidelines on proper storage and handling of household chemicals. This information is also available on the Division's web page at www.springfieldmogov.org/recycling/housechem.html. A summary of the amount of materials collected at the HCCC since it opened in 1994 is included in Appendix B. In the first permit year, 99,078 lbs. of materials were collected at the HCCC. Of this total, 79,948 lbs. were recycled and 19,130 lbs. were properly disposed of.
- ▶ The Solid Waste Management Division has also produced a *Guide to Recycling in Springfield* that includes a list of local retailers that accept used oil. This guide is published and distributed as a brochure and is also available on the Division's web page at www.springfieldmogov.org/recycling/guiderec.

Table 3 – Illicit Discharge Incidents

Date	Incident Location	Entity	Description	Investigation Result
8/26/02	2100 block S Glendale Ave	Resident	Use of diesel fuel for management of ditch vegetation	Resident was advised to use commercially available products for this purpose.
9/12/02	700 block E Edgewood St	Conco Companies	Citizen report of concrete truck discharging wash water into South Creek	Storm Water Services issued letter in Appendix D.
11/25/02	2113 E Rosebrier Place	Stanley Steemer Carpet Cleaners	Citizen report of wash water discharging from truck into street/storm drain	A Notice of Violation was issued.
12/9/02	1324 N National Ave	Nelson's Quality Auto Service	Improper management, storage and disposal of used oil	MDNR issued a Letter of Warning requiring removal of impacted soils and photographic documentation showing proper labeling and storage.
3/26/03	2545 N LeCompte Rd	WSKT Inc.	Citizen report of blue liquid in the ditch	Spillage from broken shipping container was contained on lot; residue discharged during rain. Identified as non-toxic water-based seed dye.
4/14/03	501 N Main Ave	Willow Brook Foods	Spillage of approx. 500 gallons of blood/water mixture into loading dock area and street	Supervised spill cleanup. No effects were observed in Jordan Creek.
4/21/03	1200 block E Carleton St	Springfield Ready Mix Co.	Citizen report of concrete truck spillway and wheelbarrows being washed out into a storm drain	Storm Water Services issued letter in Appendix D.
May 2003	2848 N LeCompte Rd	DeGraffenreid Pickle Products	O&S Trucking reported recurring discharge in drainage ditch	DeGraffenreid retained septic service for pumping of ditch. Installed high-level alarm in sump pump drain area to prevent non-storm water discharges; developing plan to address quality of storm water discharges. City crews to correct ponding problem in ditch with installation of concrete channel.
5/9/03	2100 block S Grant Ave	Resident	Citizen report of motor oil in the ditch	Storm Water Services issued letter in Appendix D to neighborhood.
5/15/03	1219 E Division St	IBC Butternut Bread Co.	Silver Springs Park employee reported substance in Jordan Creek	Discharge of dust control chemicals applied to IBC lot. ESRT was dispatched; services were not needed. Supervised cleanup of creek by IBC employees. Company retained Sunbelt Environmental for cleanup of lot.
6/2/03	423 N Main Ave	Positronic Industries, Inc.	Approx. 200 gallons of sodium hydrosulfide was spilled onto Main Ave.	ESRT assisted in spill containment and neutralization. No effects were observed in Jordan Creek.

Activity: 7.g - Implement program to reduce or eliminate to the extent practicable the inflow, infiltration and discharge of sanitary sewage into the MS4.

A primary objective of the City's Infiltration and Inflow (I/I) Program is to reduce to the maximum extent practicable the occurrence of sanitary sewer overflows (SSOs) into the MS4. A proactive Sewer System Evaluation Survey is conducted to identify possible sources of I/I. Currently 5 regular full-time and 15-20 contract personnel perform I/I reduction efforts. The correlation of measurements from rainfall and flow monitoring using flow meters placed at varying locations throughout the sanitary sewer system indicates the extent of I/I. Several methods are then used to identify the specific sources of I/I. These methods include visual inspection to locate faults in manhole covers and accessible pipes, as well as dye and smoke testing to locate and confirm faulty sewer pipes that may not be readily visible. TV inspection involves the use of camera equipment to do internal pipe inspections. The City

has a dedicated crew that performs TV inspection on over 20 miles of sewer pipe per year. I/I source repair techniques include manhole wall spraying, in-place pipe relining, and manhole frame and lid replacement.

I/I program personnel completed the Sewer System Evaluation Survey system-wide in June 2003. Since 1996, 41,177 lineal feet of sanitary sewer lines and over 10,442 manholes have been rehabilitated, resulting in over 81.15 million gallons per day reduction of wet-weather flows. Wet weather SSOs have significantly decreased in both frequency and duration. Treatment plant flows during wet weather conditions have experienced similar decreases in both frequency and duration of peak flow events. Ten percent of sanitary sewer revenues are earmarked to finance ongoing I/I programs. Since 1995 approximately \$14,215,000 has been used to fund the I/I effort.



Figure 17 – Rehabilitation of a sanitary sewer manhole

Following the completion of the Sewer System Evaluation Survey, it has been determined that the wastewater utility should continue the I/I Program as an ongoing effort and continue to look for opportunities to efficiently and economically reduce SSOs and I/I impacts on the wastewater infrastructure. Virtually all I/I and SSO reduction has been accomplished on the public side of the wastewater infrastructure. Studies by the wastewater utility have shown that at least 50% of the source and intrusion of wet-weather flows into the sanitary sewer system are derived from private sources, i.e. broken or leaky building sewers, leaky basements, and illegal connections of footing drains, roof drains, sump pumps, area drains, etc. Because these sources are on private property they cannot be corrected unilaterally by the wastewater utility. A funding mechanism and public acceptance of a private I/I reduction program is needed to effectively address the SSO problem. The I/I and SSO problems are often related to inadequate storm water systems and could be addressed in a cooperative manner in many cases. Information about the City's Infiltration and Inflow Program is available on the City's website at www.springfieldmogov.org/sanitary/infiltration.html.

5.7 – Construction Site Runoff

Activity: *9.a - Continue current erosion and sediment control regulations for land disturbance activities for areas less than five acres.*

Section 96-21 of the City Code states:

“No person shall cause or allow sediment to be deposited in any public street, public land, or on any property not under their control as a result of land disturbance of less than five acres resulting from construction activities.”

The City Code requires that all persons engaged in land development or land disturbance activities within the City limits must adhere to the “Erosion and Sediment Control Guidelines” issued by the Director of Building Development Services and on file with the City Clerk. These guidelines are organized to meet the following objectives:

- ▶ Minimize the area disturbed by construction and development
- ▶ Provide for containment of sediment until areas are stabilized
- ▶ Stabilize disturbed areas as soon as practical after project completion
- ▶ Provide permanent erosion, drainage, and detention controls

All site development plans are reviewed by both Building Development Services and Storm Water Services. All plans receive a stamp indicating that erosion and sediment control measures must be followed. Site inspections are conducted by Building Development Services. Development plans for subdivisions, which are reviewed by Storm Water Services, must also include measures for erosion and sediment control. Public Works conducts site inspections of subdivisions.

Activity: 9.b - *Continue to require land disturbance permits from the MDNR for sites of five or more acres.*

During the first permit year, in compliance with new MDNR regulations, the City expanded the requirement for a land disturbance permit from MDNR to include sites of one or more acres. Additionally, a new procedure has been implemented requiring developers to show that they have obtained the necessary permit from MDNR before the City will issue a building permit.

Activity: 9.c - *Provide information for education of construction site operators.*

New designers or those unfamiliar with the City's policies are provided an informational packet that includes a copy of the "Erosion and Sediment Control Guidelines". These guidelines are also available for downloading on the City's website at www.springfieldmo.gov/stormwater/stormwater_docs. Review and inspection staff members work to educate site designers and construction site operators when possible.

5.8 - Comprehensive Education and Public Outreach Program

Storm water education and public outreach activities include displays and presentations at community events, media and publications opportunities, and presentations and workshops for area audiences. Storm water/water quality issues are the primary focus of many education and public outreach activities while also being included as a closely related topic in the educational activities of the Solid Waste Management Division. This combined educational focus highlights the dual benefits for solid waste management and storm water quality of such programs as the Household Chemical Collection Center (HCCC) and the Yardwaste Recycling Center (YRC). Storm water education activities in the first permit year are described below. The City also provides funding support to the Watershed Committee of the Ozarks and the James River Basin Partnership. These local organizations provide education and public involvement opportunities on water quality issues every year.

- ◆ Storm Water Services is continually updating its website to more effectively communicate storm water issues to the public, including the impact of storm water runoff on the quality of the region's water resources. The website provides information about the City's MS4 system, storm water programs and services, and the objectives and specific requirements of the NPDES Permit and Storm Water Management Program. The website is available at www.springfieldmo.gov/stormwater.
- ◆ An educational flyer titled *Quality Ozark Streams* was included in City Utilities customer bills distributed to approximately 108,000 households in October 2002. The flyer provided information on the City's NPDES Permit, along with examples of how the public can become actively involved in storm water pollution prevention. These examples include the proper disposal of yardwaste and household chemicals, as well as guidelines for responsible yard maintenance and reporting illegal dumping. This flyer is included in Appendix D.
- ◆ In celebration of Earth Day on April 19, 2003, Public Works and community volunteers collected 16 bags of trash along South Creek between National and Dollison Avenues. This volunteer effort supplemented the hard work of the local chapter of the Audubon Society in maintaining this area.

- ◆ The City supports the efforts of local volunteer groups who participate in stenciling storm drains. This activity raises community awareness that discharges from the storm water system flow into area streams, rivers, and lakes. Storm Water Services will provide maps showing the locations of storm drains to facilitate this activity. In the first permit year, Storm Water Services provided maps to Eagle Scout Troop #210. This group stenciled 60 storm drains in the Ironbridge Subdivision in southeast Springfield. This stenciling project also received support from the James River Basin Partnership.



Figure 18 – Stenciled storm drain in the Ironbridge Subdivision in southeast Springfield

- ◆ An exhibit titled “Our Watershed” is available for interactive learning at the Discovery Center of Springfield. The exhibit contains a variety of information on storm water runoff, septic tanks, karst topography, and land uses as related to watershed issues. The exhibit, which was coordinated by the Watershed Committee of the Ozarks, received grant funding from the Missouri Department of Natural Resources with additional funding from the Solid Waste Management and Sanitary Services Divisions of Public Works, and Silver Dollar City. The exhibit is utilized in water education events.

- ◆ **Community Events** – Displays and presentations on water quality issues were provided at the following events:

- ▶ Springfield/Greene County *Dirt Festival*
- ▶ Springfield Chamber of Commerce *Business Expo*
- ▶ *Lawn & Garden Show* hosted at the Ozark Empire Fairgrounds
- ▶ *Lakes Area Water Quality Summit* organized by the Watershed Committee of the Ozarks
- ▶ *Naturescaping Symposium* at the Missouri Dept. of Conservation Nature Center
- ▶ *Earth Day* festivities at the Discovery Center of Springfield
- ▶ *Future Fest* at Jordan Valley Ice Park
- ▶ *Springfield’s Garden Festival* at Nathanael Greene/Close Park
- ▶ *Expand Your Horizons* Springfield Public Schools science career fair
- ▶ Ozark Science and Engineering Career Fair

- ◆ **Media/Publications Opportunities** – Water quality issues and programs were highlighted in the following publications and media opportunities:

- ▶ *Choose Environmental Excellence* Newsletter
- ▶ *Choose Environmental Excellence* Directory of Environmental Agencies and Organizations
- ▶ *Growing with Master Gardeners* publication
- ▶ KSMU Radio
- ▶ *Today’s Woman* magazine
- ▶ *City Beat* Program on Springfield’s Government Information Channel
- ▶ KY3 TV
- ▶ Interpreters Coalition Community Resource Guide
- ▶ *Front Porch* newsletter – Neighborhood Conservation Office
- ▶ *News-Leader*
- ▶ *State of the Environment for Springfield and Greene County 2002* report

◆ **Outreach Audiences** – Presentations and workshops on water quality issues were provided for the following audiences:

- ▶ Master Gardeners of Southwest Missouri workshop
- ▶ Regional arborist conference
- ▶ Springfield Chamber of Commerce Environmental Committee and “Leadership Springfield” class
- ▶ *Year of Clean Water* 2-day teachers workshop
- ▶ *Let’s Make a Splash* Water Education Event at the Discovery Center of Springfield
- ▶ Wesley United Methodist Church
- ▶ University of Missouri Outreach & Extension class
- ▶ Springfield Apartment Association
- ▶ Springfield Public Schools
- ▶ Willard Public Schools
- ▶ Wonders of Wildlife
- ▶ Southwest Missouri State University education and environment classes
- ▶ Drury University College of Architecture
- ▶ Audubon Society
- ▶ Community Partnership of the Ozarks
- ▶ Tan Oak Subdivision
- ▶ Sieger Drive Neighborhood Association



Figure 19 - *Let's Make a Splash* event at the Discovery Center of Springfield

6.0 Monitoring Section

6.1 - Inventory of Known Major Outfalls

Major outfalls were identified based on the following definitions from 10 CSR 20-6:

- ▶ “Outfall. A point source as defined by 10 CSR 20-2.010 at the point where a municipal separate storm sewer discharges and does not include open conveyances connecting two (2) municipal separate storm sewers, pipes, tunnels or other conveyances which connect segments of waters of the state and are used to convey waters of the state.”
- ▶ “Major municipal separate storm sewer system outfall (major outfall). A municipal separate storm sewer outfall that discharges from a single pipe with an inside diameter of thirty-six inches (36”) or more (or its equivalent) or for municipal separate storm sewers that receive storm waters from lands zoned for industrial activity within the municipal separate storm sewer system with an outfall that discharges from a single pipe with an inside diameter of twelve inches (12”) or more (or from its equivalent). Industrial activity areas do not include commercial areas.”

The equivalent of a single pipe with an inside diameter of thirty-six inches or more is further defined in 40 CFR Part 122.26 as "...discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres". The equivalent of a single pipe with an inside diameter of twelve inches or more is further defined as "...discharge from other than a circular pipe associated with a drainage area of 2 acres or more".

According to these definitions, the following types of discharge points were identified as major outfalls:

- ▶ A single pipe with an inside diameter of 36 inches or more (or a single conveyance that drains an area of more than 50 acres) that discharges at the municipal boundary or discharges into waters of the state.
- ▶ In areas zoned for industrial activity, a single pipe with an inside diameter of 12 inches or more (or a single conveyance that drains an area of 2 acres or more) that discharges at the municipal boundary or discharges into waters of the state.

The known major outfalls identified in the first permit year are listed in Appendix C. Additional major outfalls will be identified as mapping of the MS4 progresses.

6.2 - Estimate of Total Annual Volume of Urban Runoff Discharges

The total annual volume of urban runoff discharges for the City is estimated to be 7,440,473,203 gallons as shown in Table 4. The calculation is based on a total precipitation in the first permit year of 34.9 inches according to the National Weather Service station at the Springfield-Branson Regional Airport. To calculate this estimate, the individual precipitation events that occurred throughout the year were categorized by precipitation amount as shown in Table 4. The runoff volumes for categories 5 and 6 were calculated using the Runoff Curve Number method (Soil Conservation Service, 1986¹). This method uses the following equation:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

where

Q = runoff (inches)

P = rainfall (inches)

S = potential maximum retention after runoff begins (inches)

I_a = initial abstraction (inches)

and

$$I_a = 0.2S$$

$$S = \frac{1000}{CN} - 10$$

where

CN = curve number ranging from 0-100 that is determined by knowing the hydrologic soil group and land cover type

¹ Soil Conservation Service, 1986 "Urban Hydrology for Small Watersheds", Technical release 55, Washington, DC: U.S. Department of Agriculture

The CN is a weighted average of the CN for the impervious and pervious cover types according to the percentage of these types in the City limits. The percentage of impervious cover and the type and percentage of pervious cover were estimated through examination of aerial photographs of the City. The total discharge volume is determined by multiplying Q by the total area within the City limits. The following numbers were used in calculating the runoff volume for categories 5 and 6:

- ▶ % Impervious = 35
- ▶ Impervious CN = 98
- ▶ % Pervious Cover = 65
- ▶ Pervious CN = 73
- ▶ City area = 48,278 acres

Using the SCS Curve Number method, the precipitation amount for categories 1-3 is not great enough to overcome the calculated infiltration loss, resulting in a runoff volume of zero. However, experience dictates that these rainfall events do in fact create a substantial amount of runoff, which is largely due to the amount of directly connected impervious area within the watershed. Therefore, a more accurate estimate for these categories can be obtained by assuming that directly connected impervious area is the sole source of runoff from precipitation events in these categories. The area within the City limits is estimated to be 35% impervious. It is estimated that half of the impervious area, equaling 8,449 acres, is directly connected. The runoff volume for these categories is estimated by multiplying the precipitation amount by 8,449 acres. For category 4, the calculation of runoff using the SCS Curve Number method results in a volume less than the calculated volume for category 3. Therefore, the runoff volume for category 4 was calculated with the same method used for categories 1-3.

Table 4 – Total Annual Volume of Urban Runoff Discharges

Precipitation Category (inches)		Average Precipitation	# of Events Per Category	Runoff "Q" (inches)	Runoff Volume Per Event		Total Runoff Volume	
					Cubic Feet	Gallons	Cubic Feet	Gallons
#1	0 – 0.1	0.02	71	0.02	613,400	4,577,610	43,551,400	325,010,339
#2	0.11 – 0.2	0.15	17	0.15	4,600,498	34,332,078	78,208,466	583,645,326
#3	0.21 – 0.4	0.29	18	0.29	8,894,297	66,375,351	160,097,346	1,194,756,315
#4	0.41 – 0.8	0.56	16	0.56	17,175,194	128,173,091	274,803,104	2,050,769,460
#5	0.81 – 1.6	1.05	13	0.12843	22,508,182	167,971,509	292,606,366	2,183,629,620
#6	>1.6	1.65	2	0.42156	73,878,364	551,331,071	147,756,728	1,102,662,143
							997,023,410	7,440,473,203

6.3 – Monitoring Program Summary

6.3.1 Program Rationale

The Representative Monitoring Program and the Field Screening Program comprise a two-fold approach to monitoring the MS4. These programs will establish a base line from which to monitor the effectiveness of the SWMP. Table 2 on page 10 illustrates the calendar schedule specified in the Permit for these programs. The Field

Screening Program, which serves to identify illicit discharges and quantify the quality of industrial discharges to the MS4, is discussed in Section 5.6 of this report.

The Representative Monitoring Program represents a shift from in-system sampling and land-use based characterization to in-stream sampling with a regional perspective. In Part 1 of the original Permit application, six points were identified as being representative of either residential, commercial or industrial land uses in the City. The data collected and presented in Part 2 of the application indicates that pollutant levels in storm water from these land uses are generally below the Nationwide Urban Runoff Program (NURP) event mean concentrations for the respective land use types. It was proposed to use six in-stream locations representative of the City's entire watershed to better measure the effectiveness of the SWMP. These six in-stream locations are near the City limits and emphasize the cumulative effect of storm water runoff from the minor watersheds identified in Parts 1 and 2 of the Permit application. These locations are listed below and shown in Figure 20.

1. **South Creek at Golden.** This location drains mostly residential.
2. **Jordan Creek at Bennett.** This location drains the oldest and most industrialized portion of the City.
3. **Wilsons Creek at Farm Road 146.** This location drains approximately 40% of the City, including the oldest portion of the City.
4. **Galloway at Highway 60.** This location drains an area of the City representing all the land uses i.e. small to large residential lots, commercial, and manufacturing.
5. **Jones Spring.** This location drains a large sinkhole cluster area of the City.
6. **Pea Ridge at Farm Road 102.** This location drains the northern portion of the City and has Interstate-44 running through the drainage area.

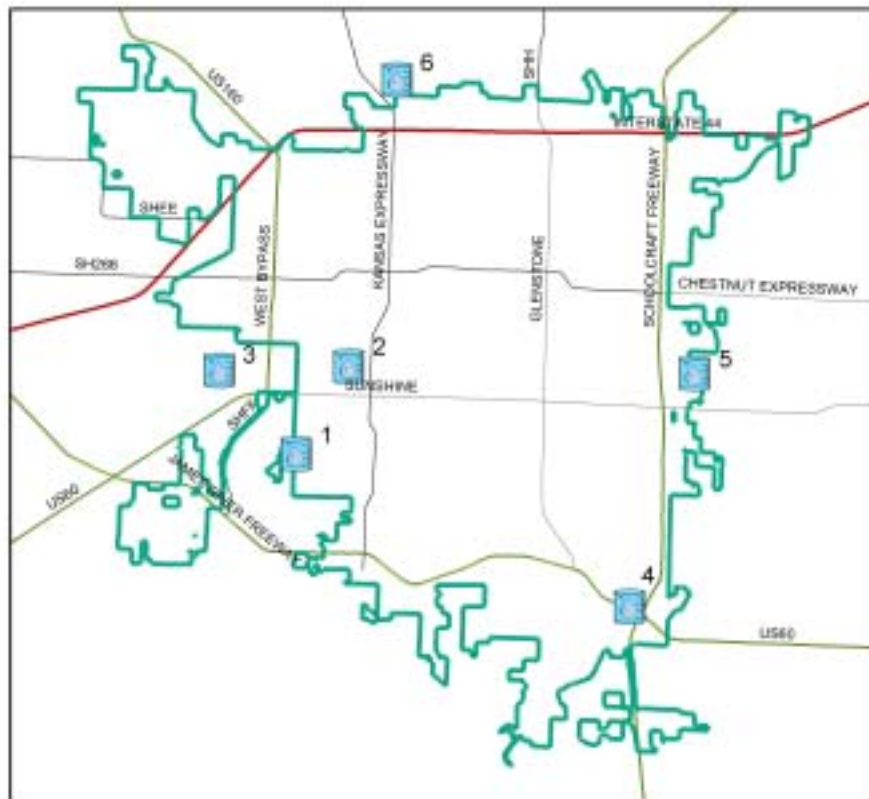


Figure 20 – Locations of in-stream sampling sites

The Representative Monitoring Program consists of two types of sampling events:

- ▶ Ambient sampling representing the quality of the stream base flow, to be completed at each of the six in-stream locations during the second weeks of November, March, and May.
- ▶ Wet-weather sampling, representing the influence of storm water runoff on water quality, to be completed once at each of the six in-stream locations during the period of March 1 through May 31.

6.3.2 Monitoring Results

The ambient sampling events were completed on November 11, March 10, and May 13. The wet-weather sampling event was completed on April 7. Samples were analyzed at the City's Wastewater Laboratory at the Southwest Wastewater Treatment Plant. The results for the conventional parameters listed in Part V. of the Permit are shown in Table 5. All of the results for the metals, pesticides, volatile organics (method 624 & 603), and acid/base neutral organics (method 625) listed in Part V. of the Permit were below detectable limits. One set of the lab analysis sheets for these parameters is included in Appendix C.

As noted in Table 5, no sample was collected from the Pea Ridge Creek sampling site on 11/12 due to the creek being dry. Precipitation records from the National Weather Service station at the Springfield-Branson Regional Airport for the period of January through October 2002 indicate that the total rainfall for this period was 3.33 inches lower than normal. The fall season was particularly dry. The total rainfall for September was 4.27 inches below the monthly normal and October was 0.21 inches below the monthly normal. The dry trend continued in the first part of November prior to the sampling event on the 12th. The rainfall during this period was 0.53 inches. Based on this precipitation data, it is probable that the dry conditions of the creek were due to lower than normal precipitation amounts and not to the creek flow being seasonal in nature. An alternative sampling site will not be sought unless dry creek conditions recur at this site during future sampling periods. Also as noted in Table 5, samples collected on March 10 were not analyzed for phenolics. This was due to a miscommunication, which has been corrected, between lab personnel and sampling personnel regarding the number of containers of sample needed.



Figure 21 - In-stream sampling of South Creek

Table 5 – Representative Monitoring: Analysis Results of Ambient and Wet-Weather Samples

Site	Date	pH	BOD	COD	TSS	TDS	Ammonia nitrogen (NH3-N)	Nitrate/Nitrite	Total Kjeldahl Nitrogen	Dissolved Phosphorus	Total Phosphorus	Cyanide	Phenolics	Oil & Grease	Fecal Coliform	Fecal Strep
SC	11/12	7.71	<1	4	3	173	<0.1	0.17	0.06	0.03	0.04	<0.005	<0.01	6.4	<10	<10
	3/10	7.91	<1	18	2	<13	<0.1	1.28	0.053	0.018	0.073	<0.005	N/A*	4.4	20	10
	4/7	7.16	1	12	11	267	<0.1	0.92	0.36	0.084	0.17	<0.005	<0.01	4.9	270	10
	5/13	7.05	1	21	9	213	0.13	0.45	0.36	0.097	0.15	<0.005	<0.01	5.5	20	140
JC	11/12	7.47	<1	6	<1	373	<0.1	1.5	0.25	0.04	0.05	<0.05	<0.01	3.6	<10	<10
	3/10	7.48	<0.1	22	16	373	<0.1	0.22	0.42	0.042	0.05	<0.005	N/A*	2.3	10	20
	4/7	7.17	1	23	2	387	<0.1	2.08	0.32	0.03	0.03	<0.005	<0.01	2.6	270	50
	5/13	7.24	1	29	2	439	0.23	2.22	0.19	0.1	0.1	<0.005	<0.01	9	890	480
WC	11/12	7.86	<1	4	2	333	<0.1	1.02	0.06	<0.01	0.06	<0.05	<0.01	3.9	<10	10
	3/10	7.99	1	25	19	373	<0.1	0.36	0.194	0.013	0.028	<0.005	N/A*	5.2	10	<10
	4/7	7.3	2	20	3	347	<0.1	1.94	0.09	0.02	0.04	<0.005	<0.01	3.3	220	10
	5/13	7.45	1	5	<1	413	0.12	1.95	0.16	0.035	0.05	<0.005	<0.01	5.7	400	230
GC	11/12	7.68	<1	184	<1	253	<0.1	1.54	<0.01	<0.01	0.01	<0.005	<0.01	5.3	<10	20
	3/10	7.91	<1	47	1	267	<0.1	2.9	<0.01	0.016	0.028	<0.005	N/A*	3.5	20	20
	4/7	7.54	1	19	3	373	<0.1	2.16	0.23	0.01	0.05	<0.005	<0.01	2.9	250	80
	5/13	7.45	<1	14	2	293	<0.1	2.21	0.01	0.007	0.03	<0.005	<0.01	7.1	120	180
JS	11/12	7.54	<1	10	<1	333	<0.1	3.82	<0.01	<0.01	0.03	<0.005	<0.01	5.9	<10	<10
	3/10	6.82	<1	40	<1	373	<0.1	4.46	<0.01	0.032	0.056	<0.005	N/A*	2.4	95	<10
	4/7	6.43	1	22	2	360	<0.1	2.76	<0.01	0.027	0.11	<0.005	<0.01	2.7	400	520
	5/13	6.4	<1	10	<1	359	<0.1	3.51	<0.01	0.023	0.04	<0.005	<0.01	4.4	620	540
PR	11/12	N/A - dry creek														
	3/10	7.45	<1	15	5	440	<0.1	2.47	0.664	0.017	0.049	<0.005	N/A*	2.2	30	10
	4/7	7.44	1	26	1	413	<0.1	2.2	0.08	0.01	0.05	<0.005	<0.01	2.7	670	190
	5/13	7.27	<1	17	<1	399	<0.1	2.24	0.31	0.04	0.05	<0.005	<0.01	4.7	770	450

SC = South Creek at Golden Avenue GC = Galloway Creek at Highway 60

JC = Jordan Creek at Bennett Street JS = Jones Spring

WC = Wilsons Creek at Farm Road 146 PR = Pea Ridge Creek at Farm Road 102

All parameters are measured in mg/l, except Fecal Coliform and Fecal Strep are per 100ml.
See Table 6 for definition of abbreviated parameters.

*Analysis for phenolics was unavailable for the sampling event on 3/10

6.3.3 Results Discussion

The sample analysis results were evaluated through comparison with the *Criteria for Designated Uses* as published in 10 CSR 20-7.031. Jordan Creek, Pea Ridge Creek, Galloway Creek, Wilsons Creek, and South Creek are all classified as general warm water fisheries with use designations for “Livestock & Wildlife Watering” and “Protection of Warm Water Aquatic Life and Human Health – Fish Consumption”. Pea Ridge Creek is additionally designated as a “Drinking Water Supply.” Jones Spring is not specifically classified. For the purpose of this comparison, the criteria for groundwater were used for evaluation of results from Jones Spring. All of the sample analysis results for the six sites for the pollutants listed in the criteria were below the limits for the designated uses or were below current detection limits.

With the exception of the sampling site on Pea Ridge Creek, the sampling sites are in the James River watershed. The James River Total Maximum Daily Load (TMDL), issued by the Missouri Department of Natural Resources in May 2001, sets limits of 0.075 mg/l for total phosphorus and 1.5 mg/l for total nitrogen for all classified streams that are tributaries of the James River. Total nitrogen is defined in the James River TMDL as kjeldahl nitrogen plus ammonia nitrogen. In the parameters listed in the Permit, total kjeldahl nitrogen is equivalent to this definition of total nitrogen. The results from the South Creek sampling events on 4/7/03 and 5/13/03, the Jordan Creek sampling event on 5/13/03, and the Jones Spring sampling event on 4/7/03 exceeded the TMDL limit for total phosphorus. The remaining results for the sampling events at each of the five sites were below the TMDL limits for total phosphorus and total nitrogen.

In order to establish trends in the data, total averages for each of the parameters were calculated along with sampling event and site averages, as shown in Table 6. The averages for the wet-weather sampling event on 4/7/03 indicate higher levels of BOD, TDS, nitrate+nitrite, TKN, total phosphorus, fecal coliform and fecal strep in comparison to the ambient sampling events averages. The total averages and the averages for the wet-weather sampling event on 4/7/03 were compared with national data collected for the Nationwide Urban Runoff Program (NURP) in the early 1980s. All of these results were below the NURP event mean concentration averages² except for the results for nitrate/nitrite. The sampling that was conducted in 1992 and 1993 for Part II of the Permit application also showed levels of nitrate/nitrite above the NURP averages. Table 5 also reflects seasonal trends in the data. The samples from 4/7/03 and 5/13/03, collected during springtime conditions usually characterized by more frequent rain and increasing human and animal activity, show higher levels for many of the parameters. Although no single sampling location exhibited higher levels for all parameters when compared to the other locations, the sample results from South Creek most frequently showed higher levels, specifically for TSS, dissolved phosphorus, total phosphorus, and oil & grease.

² As listed in City of Springfield, Missouri Stormwater NPDES Permit Application Part 2, 1993

Table 6 – Representative Monitoring: Sampling Results Averages

Parameter	Ambient Averages	Total Averages	Sampling Event Averages				Sampling Site Averages					
			11/12/02	3/10/03	4/7/03	5/13/03	SC	JC	WC	GC	JS	PR
pH	7.46	7.38	7.65	7.59	7.17	7.14	7.46	7.34	7.65	7.65	6.80	7.39
BOD	<0.95	<1	<1	<0.85	1.17	<1	<1	<0.775	<1.25	<1	<1	<1
COD	28.5	25.8	41.6	27.8	20.3	16	13.75	20	13.5	66	20.5	19.3
TSS	<4.75	<3.91	<1.6	<7.33	3.67	<5.33	6.25	<5.25	<6.25	<1.75	<1.25	<2.33
TDS	<318	<329	293	<307	358	353	<167	393	367	297	356	417
NH3-N	<0.11	<0.1	<0.1	<0.1	<0.1	<0.130	<0.108	<0.133	<0.105	<0.1	<0.1	<0.1
Nitrate + Nitrite	1.89	1.93	1.61	1.95	2.01	2.10	0.705	1.51	1.318	2.20	3.64	2.30
TKN	<0.159	<0.168	<0.078	<0.225	<0.182	<0.173	0.208	0.295	0.126	<0.065	<0.01	0.351
Dissolved P	<0.031	0.031	<0.020	0.023	0.030	0.050	0.057	0.053	<0.020	<0.011	<0.023	0.022
Total P	0.052	0.058	0.038	0.047	0.075	0.070	0.108	0.058	0.045	0.030	0.059	0.050
Cyanide	<0.011	<0.008	<0.023	<0.005	<0.005	<0.005	<0.005	<0.016	<0.016	<0.005	<0.005	<0.005
Phenolics	<0.01	<0.01	<0.01	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Oil & Grease	4.81	4.37	5.02	3.33	3.18	6.07	5.3	4.38	4.53	4.7	3.85	3.2
Fecal Coliform	<170	<223	<10	30.8	347	470	<80	<295	<160	<100	<281	490
Fecal Strep	<121	<131	<12	<13.3	143	337	<42.5	<140	<65	75	<270	217
Site Abbreviations: SC = South Creek at Golden Avenue; JC = Jordan Creek at Bennett Street; WC = Wilsons Creek at Farm Road 146; GC = Galloway Creek at Highway 60; JS = Jones Spring; PR = Pea Ridge Creek at Farm Road 102												
Parameter Abbreviations: BOD = Biochemical Oxygen Demand; COD = Chemical Oxygen Demand; TSS = Total Suspended Solids; TDS = Total Dissolved Solids; NH3-N = Ammonia Nitrogen; TKN = Total Kjeldahl Nitrogen; P = Phosphorus												

6.3.4 Record of Personnel Participation in Collection of Samples

<u>Sampling Event</u>	<u>Personnel</u>
11/12/02	Bob Corson, Pretreatment Inspector, Sanitary Services Division, Public Works Keith Francis, Professional Engineer, Storm Water Services Division, Public Works Carrie Lamb, Environmental Assistant, Storm Water Services Division, Public Works Greg Roeder, Engineer Technician I, Storm Water Services Division, Public Works
3/10/03	Carrie Lamb, Environmental Assistant, Storm Water Services Division, Public Works
4/7/03	Carrie Lamb, Environmental Assistant, Storm Water Services Division, Public Works
5/13/03	Carrie Lamb, Environmental Assistant, Storm Water Services Division, Public Works

6.3.5 Storm Event Data

The storm event data for the wet-weather sampling event on April 7 is included as specified under Part V.A.2 of the Permit. The storm event sampled occurred on April 6. According to data from the National Weather Service station at the Springfield-Branson Regional Airport, the event total rainfall was 1.09 inches occurring over 11 hours. The previous measurable storm event occurred on March 28 with a total rainfall of 0.85 inches ending approximately 8 days and 13 hours before the sampled storm event. The total discharge volumes at each of the six in-stream locations for the sampled storm event of April 6 were estimated using the SCS Runoff Curve Number outlined in Section 6.2. The total discharge volumes are listed in Table 7 along with the calculation values used.

The total discharge volume for Jones Spring was calculated by using a basin area of 48 contributing sinkholes and assuming that all water entering these sinkholes discharges at Jones Spring.

Table 7 – Discharge Volumes for Wet-Weather In-Stream Sampling Event

Outfall Location	Impervious %	Impervious CN	Pervious cover type %	Pervious CN	Average CN	Runoff "Q" (inches)	Basin Area (acres)	Discharge Volume (cubic feet)	Discharge Volume (gallons)
South Creek at Golden	25	98	75	75	80.75	0.12547	3,305	1,574,328	11,233,190
Jordan Creek at Bennett St.	30	98	70	75	81.9	0.14692	8,780	1,505,247	34,944,680
Wilsons Creek at FR 146	28	98	72	75	81.44	0.13807	19,174	1,406,185	71,714,490
Galloway Creek at Hwy 60	25	98	75	72	75.12	0.08961	4,323	4,682,587	10,493,915
Jones Spring	23	98	77	76	81.06	0.13103	1,832	9,609,742	6,502,737
Pea Ridge Creek at FR 102	22	98	78	72	77.72	0.07890	5,497	871,367	11,748,713

6.4 Floatables Monitoring

Two locations have been designated for removal of floatables as required in Part V.B. of the Permit. These locations were identified as points of significant accumulation of debris based on the experience of Public Works personnel and the frequency of citizen requests for cleaning at these locations. According to the Bridge & Waterways Maintenance Section of Public Works, it is estimated that 20-25 cubic yards of floatables and debris was collected from Location 1 and 25-30 cubic yards of floatables and debris was collected from Location 2 during the first permit year.

- ▶ Location 1 – Channel on the east side of Grant Avenue approximately 100 feet north of Portland Street
- ▶ Location 2 – Detention basin at the southwest corner of Carleton Street and Bothwell Avenue



Figure 22 - Floatables Monitoring Location 1 at Portland and Grant



Figure 23 – Floatables Monitoring Location 2 at Carleton and Bothwell

7.0 Summary of Modifications to the Storm Water Management Program

The Storm Water Management Program has served the City effectively over the course of the first permit year. It is anticipated that the current SWMP will be continued in the second permit year to continue developing a knowledge and understanding of the BMPs for storm water. The activities required during the second permit year will be added to the SWMP. Beyond these additions, no modifications to the SWMP outlined in the Permit are proposed at this time.

8.0 Fiscal Analysis

Program	Funding Source	Actual Expenses FY 02/03	Est. Budget FY 03/04
Hard Costs³			
Permit Administration – Storm Water Services Division: 2 full-time staff plus management and administration staff	Storm Water Bond Issue ⁴ and General Fund	\$76,000	\$90,000
Supplies & Equipment for Permit activities	Storm Water Bond Issue and General Fund	\$10,000	\$6,000
GIS hardware/software	Storm Water Bond Issue and General Fund	\$4,000	\$4,000
Training and Professional Services and Studies	Storm Water Bond Issue and General Fund	\$30,000	\$10,000
Sampling Lab Services (Representative monitoring and Wet-weather Field Screening)	Storm Water Bond Issue and General Fund	\$44,000	\$44,000
City Utilities insert – “Quality Ozark Streams”	Storm Water Bond Issue and General Fund, Sanitary Services Fund, Transportation Fund, Landfill Tipping Fees	\$1,869	\$1,900
Total		\$165,869	\$155,900
Soft Costs			
Water Quality Improvement Projects	Storm Water Bond Issue	\$653,615 ⁵	\$660,000
Vegetation Management of Waterways & Basins	Detention Buyout Fund	\$1,545	\$1,545
	Transportation	\$250,505	\$199,815
	General Fund	\$291,845	\$462,995
Tree Planting & Maintenance	General Fund	\$496,450	\$663,695
Solid Waste Division Education Program ⁶ w/ water quality emphasis	Landfill Tipping Fees	\$38,900	\$38,900
Household Chemical Collection Center	Sanitary Services (\$60,000)		
	Landfill Tipping Fees	\$104,500	\$104,500
Yardwaste Recycling Center	Landfill Tipping Fees	\$348,000	\$348,000
Infiltration/Inflow Program	Sanitary Sewer Revenue	\$1,286,471	\$2,243,500
Floodplain Acquisition Program	Storm Water Bond Issue	\$856,750	\$900,000
Debris collection – grate, waterway, bridge, and sinkhole routes	Transportation Fund	\$30,000 ⁷	\$35,000
Street Cleaning	Transportation Fund	\$491,000 ⁸	\$535,000
USGS Cooperative Stream Gauge Project	Storm Water Bond Issue and General Fund	\$17,300	\$17,300
Watershed Committee of the Ozarks	General Revenue Fund	\$41,000	\$41,000
James River Basin Partnership	General Revenue Fund	\$5,000	\$5,000
Total		\$4,912,881	\$6,256,250
Grand Total		\$5,078,750	\$6,412,150

³ Hard costs are expenses for activities conducted solely for the purpose of compliance with Permit requirements; soft costs are expenses for activities that are part of the Permit requirements and/or overall SWMP, but would be conducted by the City regardless of the Permit.

⁴ The Storm Water Bond Issue is funded by the Level Property Tax.

⁵ Includes City costs for Ingram Mill detention basins project, Edgewater Drainage Improvement Project, and Upper Galloway channel stabilization project.

⁶ A small portion of funds for the Solid Waste Management Division Education Program, HCCC, and YRC comes from donations and from the sale of YRC products.

⁷ Additionally, MoDot spends approximately \$10,000 on curb inlet cleaning of state-maintained thoroughfares within the City limits.

⁸ Includes personnel, services, and supplies for all street cleaning activities including sweeping, debris pickup, grate cleaning, and vacuuming ditches. Additionally, MoDot spends approximately \$30,000 on sweeping state-maintained thoroughfares within the City limits.